1933

UNITED STATES DEPARTMENT OF AGRICULTURE
Weather Bureau
Instrument Division
SPECIFICATIONS FOR THERMOMETERS, METEOROLOGICAL, MAXIMUM
Mounted on corrosion resisting steel backs.

1. Stems- The stems shall be of glass, about 1/4 inch in diameter (between 7/32-inch and 9/32-inch).

2. White strip- To facilitate readings a strip of white glass shall be provided running the full length of the stem back of the bore.

3. Bulbs- Bulbs shall be spherical in form and not less than 3/8-inch nor more than 1/2-inch in diameter. Bulbs shall be of clear glass of a quality that will not change appreciably with age.

4. Length- Length of stem and bulb combined to form the tube shall be 10-1/2 inches (between 10-3/8 inches and 10-5/8 inches).

5. Filling- Thermometers shall be filled with pure mercury; the space not occupied by the mercury to be practically a vacuum.

6. Terminal nib- As a provision for holding the tube in its proper relation to the back when subsequently mounted, a short nib will be formed at the upper end of the stem. It must not be so long as to protrude appreciably beyond the back.

7. Constriction- In order to provide for self registration, a constriction shall be formed at a point not more than 1/2 inch above the bulb. The constricted portion of the stem shall be carefully annealed to minimize residual stresses.

8. Graduations and markings on tubes- All lines, figures, and letters to be etched, clean cut, straight and distinct. Graduations shall be to whole degrees Fahrenheit. The first and each succeeding 5 and 10 degree line to be longer than the remaining lines. Graduations to be numbered at each multiple of 10 degrees Fahrenheit. Numbers below zero to be preceded by a minus sign. The lowest line of graduation must not be nearer the constriction than a distance equal to 10 degrees of the scale. The figures shall be horizontal and above the bore when the stem is horizontal with the bulb to the left. All etchings to be filled with best quality black pigment.

Each tube will bear near the upper end a serial number (indicated in the order) and the initials U. S. W. B.

9. Scale options.- The approximate scale will be -35° to 110°F.; -30° to 110°F.; -20° to 120°F.; or zero to 140° F.; or the equivalent in Centigrade; as may be specified in the order.

10. Scale length- The scale will extend over the entire usable length of the tube, about 8 inches, and will be as open as the scale specified in the order permits. Reasonable tolerances above and below the stated limits will be allowed provided they do not produce an unduly compressed or open scale.

11. Scale error.- At the ice point, 32° Fahrenheit, the scale error must be no greater than 0.2 degree.

At any other point of the scale between plus 12° and a point within 10 degrees of the upper end the error must be no greater than 0.3 degree.

At any point of the scale between plus 12° and a point within 10 degrees of the lower end the error must be no greater than 0.6 degree Fahrenheit.

The change in the error for a distance of 10 degrees must be no greater than 0.3 degree Fahrenheit on any part of the scale.

12. Mounting.- Each thermometer tube must be mounted upon a metal back consisting of a strip, which has parallel sides, of corrosion resisting steel 1/32 inch thick by 29/32 inch (not less than .900 nor more than .910 inches) wide by 12 inches long, conforming to Navy Department Specifications 47S20a dated May 28, 1934, symbol designation CRS1, mat finish. A circular hole 11/16 of an inch in diameter must be cut in one end of the strip, forming an opening in which the bulb of the thermometer must be centrally placed. At the opposite or top end of the strip a 1/8-inch hole must be drilled, with its center 1/4-inch from the top margin. A corrugation not less than 1/8-inch deep, curved to fit the thermometer tube, must be formed in the back, the corrugation extending lengthwise from the 11/16-inch hole provided for the bulb to the position of the terminal nib of the glass stem. At the upper end of the corrugation a suitable hole must be cut through the back to receive the terminal nib described in paragraph 6.

13. Markings on backs- Graduation lines for each multiple of 5 degrees must be made on the backs opposite the corresponding graduations on the tube. Appropriate numbers must be made on the back opposite each multiple of 10 degrees. The word "MAXIMUM" shall be stamped across the back in a position about 3/4-inch below the upper end. The serial number of the thermometer and the letters U.S.W.B., or such identification as may be directed by other purchasing agencies, shall be placed on the right hand margin. Markings shall be filled with best quality black pigment.

14. Clamps- The glass tubes must be secured to the back by corrosion resisting steel straps, carefully and well made, and so formed as to properly fit and hold the tubes to the back, and attached by fillister head screws No. 1-72, made of corrosion resisting steel. The part of the clamp that passes over the tube shall be narrowed to one-sixteenth inch. Edges shall be free of burrs and other roughness.

15. Workmanship.- First class and thoroughly finished instruments are required. For example, stems must be straight and of uniform bore and free from scratches. Lines must be clean cut and straight, without ragged edges. Bulbs must be of uniform thickness and joined to the stems in a smooth and workmanlike manner. Metal parts must be free from burrs, cracks, or rough or sharp edges, corners shall be sufficiently rounded to prevent possible cutting of the hand.

16. Inspection.- Each instrument will be carefully inspected and tested before acceptance; but recognizing the difficulty attending the production of a large number of thermometers that come within the limits prescribed in these specifications, it is stated that while the purchasing

bureau or department will in its discretion strictly adhere to said specifications, yet it is not the intention to reject instruments inherently correct and of good workmanship, provided the greater part of the thermometers furnished come within the limits herein prescribed, and prove satisfactory throughout.

17. Ten percent rejection.- It will be understood that failure of 10% or more of the thermometers delivered to meet the specifications herein set forth will subject the entire order to rejection.

18. Test for retreating tendency- The tubes will be placed vertically in a bath having a temperature of 92 degrees Fahrenheit. The bath will then be permitted to cool at a slow rate to ordinary room temperature of about 68 degrees, the tubes remaining vertical and not subject to jar. They must not retreat to room temperatures under test.

19. Test for closeness of constriction- The tubes having been previously subjected to ordinary room temperatures will be placed in a whirling machine with the bulbs in shaved ice and 14 inches from the center of rotation. After allowing time for thorough cooling they will be rotated at a speed of 240 revolutions per minute for a period of one minute. They must then indicate the ice temperature within allowed limits.

20. Prospective bidders will be required to furnish evidence of their ability to produce and deliver in the quantity required thermometers of the character indicated in the above specifications.

21. Ice point.- There must be no change in the ice point measureable by customary methods of testing during a period of 90 days. The right is reserved to delay payment for a period of 90 calendar days for the purpose of making repeat tests to determine shift of the ice point.

B. C. Kadel,
Chief of Division

Washington, D. C.,
November 9, 1938.

These specifications supersede specifications for maximum thermometers dated November 8, 1935.